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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/923,834

08/07/2001

Robert F. Darveaux

M-10966 US

1262

7590

06/10/2002

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EXAMINER

ERDEM, FAZLI

ART UNIT

PAPER NUMBER

2826

DATE MAILED: 06/10/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/923,834

Applicant(s)

DARVEAUX ET AL.

Examiner

Fazli Erdem

Art Unit

2826

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 March 0202.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7,9-16 and 18-23 is/are rejected.
- 7) ☒ Claim(s) 8 and 17 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Allowable Subject Matter

1. Claims 8 and 17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claim 1-5, 9-16, 18, 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tao et al. (6,229,702) in view of Shin et al. (5,854,511).

Regarding Claim 1 and 16, Fig. 1 of Tao et al. shows a ball grid array semiconductor package having improved heat dissipation efficiency, with a substrate 12 having a first side and a second side, a die 11 having a first side and a second surface attached to the substrate, a heat sink 10 mounted on the substrate and it's located above the die 11, epoxy encapsulant completely covering the die and the heat sink. In Tao et al. the heat sink 10 is not attached to the die. However, Shin et al. show a semiconductor package including heat sink, where in Fig. 1 heat sink 20 is attached to the die 10.

Regarding Claims 2-5, 12, 13 and 14 in Tao et al. Fig. 1, the heat sink is located above the die 11 and in Shin et al. Fig. 1, the heat sink 20 is located below the die 10, and in both cases the die is electrically coupled to the substrate via wires. In Fig. 1 of Tao et al. detail 15 are the ball grid array.

Regarding Claims 9-11 and 18 in Fig. 1 of Tao et al. the heat sink 10 has a middle layer, multiple angled layers and two outer layers.

Regarding Claim 15 and 19 in Fig. 1 of Tao et al., encapsulant 19 is located on the outer portions of heat sink 10

It would have been obvious to one of having ordinary skill in the art to attach the heat sink to the die and have the heat sink on the bottom of the die rather than the top in Tao et al. as taught by Shin et al. because such positioning would provide better heat dissipating characteristics.

3. Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tao et al. (6,229,702) in view of Shin et al. (5,854,511) further in view of Yalamanchili (5,929,514).

In combination Tao et al. and Shin et al. disclose all the claimed subject matter except they fail to specify a thermally conductive adhesive with thickness of 1 mil or less between the heat sink and the die.

However, Yalamanchili shows a thermally enhanced lead-under paddle i.e. leadframe where in Fig. 5 the thermally conductive adhesive layer between the heatsink and die is less than 1 mil.

It would have been obvious to one of having ordinary skill in the art at the time the invention was made to include a thermally conductive adhesive with thickness less than 1 mil in Tao et al. and Shin et al. as taught by Yalamanchili because such structure would provide a better reliability.

4. Claims 20-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tao et al. (6,229,702) in view of Shin et al. (5,854,511) further in view of Marrs (5,482,898).

Tao et al. and Shin et al. in combination disclose all the claimed subject matter except they fail to specify the method of making their respective devices. However, Marrs disclose a method of forming a semiconductor device having a thermal dissipator and electronic shielding where he describes a method of attaching a die to substrate, attaching a heatsink to the die, encapsulating the die and the heatsink.

It would have been obvious to one of having ordinary skill in the art to provide a method of making a semiconductor device with a heatsink in Tao et al. and Shin et al. as taught by Marrs, because such method would lead to production of a semiconductor device with improved heat dissipation characteristics.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fazli Erdem whose telephone number is (703) 305-3868. The examiner can normally be reached on M - F 8:00 - 5:00.

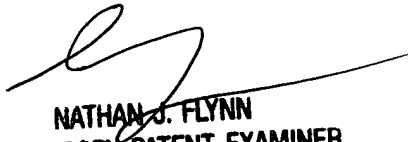
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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (703) 308-6601. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

FE
June 6, 2002



NATHAN J. FLYNN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800